

Declaration Management Experiment Plan

Presented to:

AMG-12

12 June 1996

Need for Declaration Management

- **Key to Scalability**
- **Reduce Processing Load on the Receiver**
- **Reduce Communications Bandwidth Requirements**

Send Data Only When & Where it is Needed

Declaration Management (DM) =

- **All the RTI Services Associated with Sending Object Data When & Where it is Needed**
- **Includes:**
 - **Subscription**
 - **Publication**
 - **Filter Mechanisms**
 - **Establishment of Communications Channels**

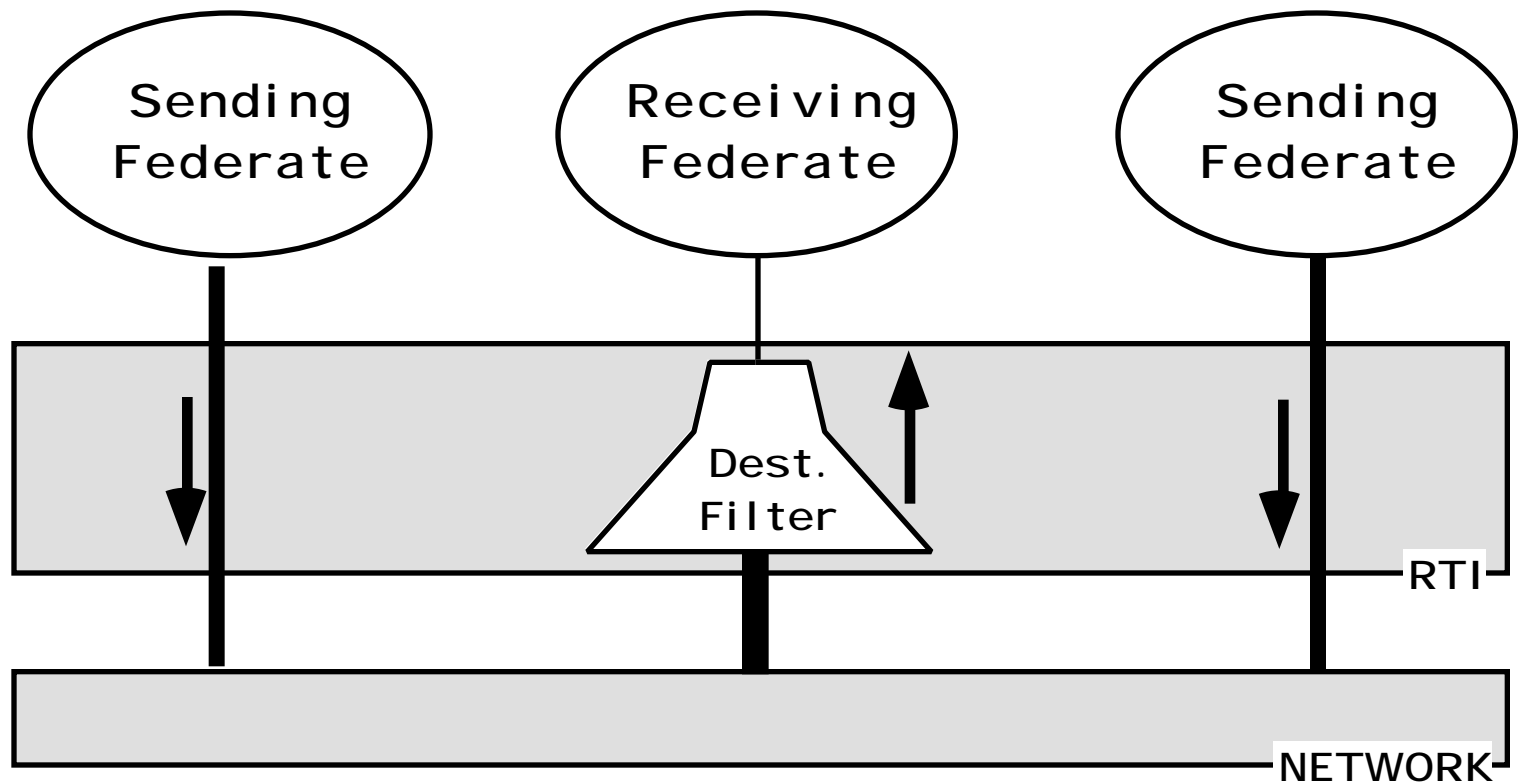
Basic Declaration Management Services

- **Publication -- Federate Tells the RTI What Object Classes & Their Attributes it can Update**
- **Subscription -- Federate Tells the RTI the Object Classes & Their Attributes in Which it is Interested**
- **Attribute Update -- Federate Tells the RTI the Value of an Attribute That it Owns**
- **Reflect Attribute -- RTI Distributes Attribute Value to Subscribing Federate(s)**

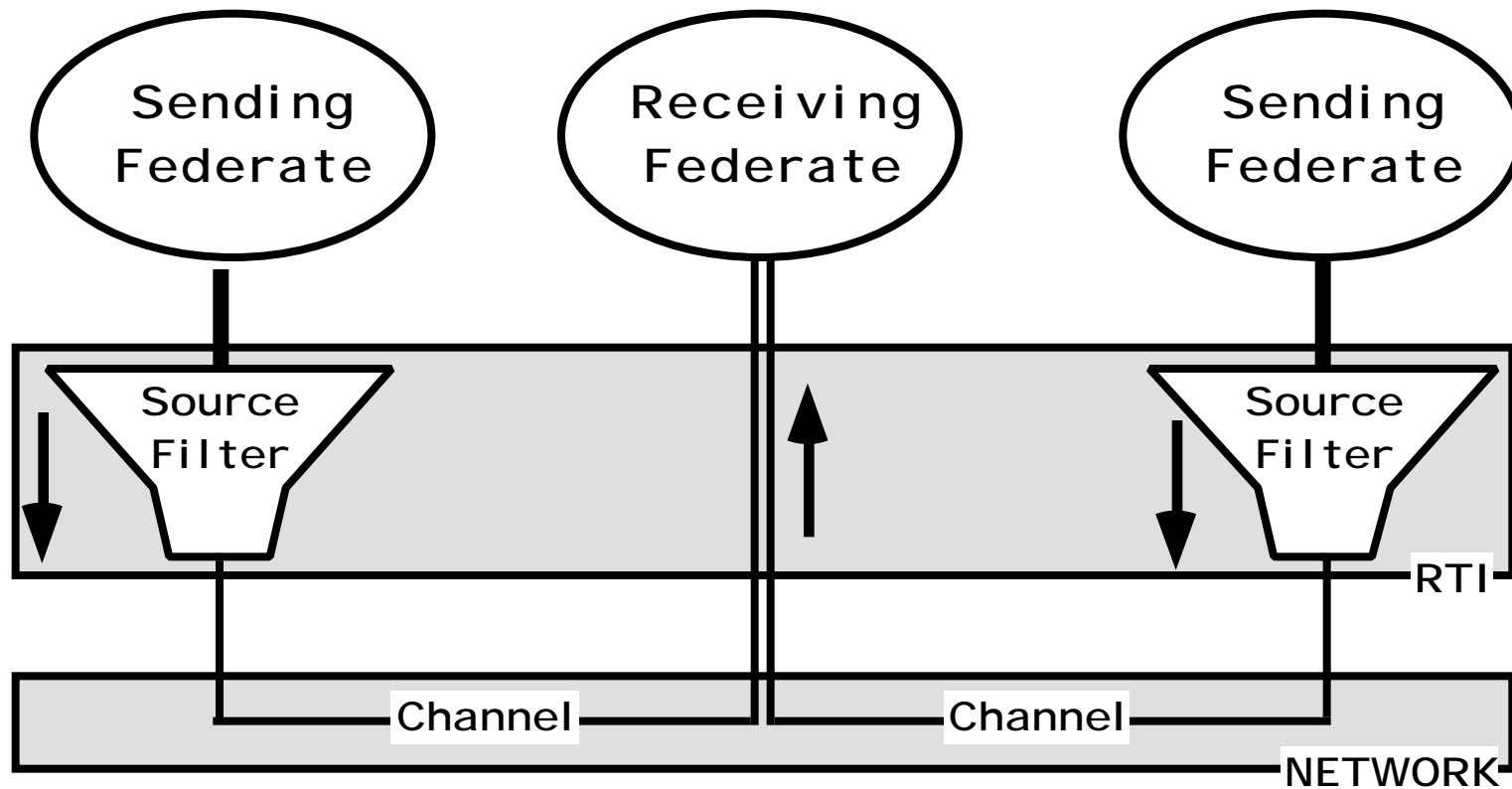
Subscription Options

- **Static Class Attribute -- Tell me the Location of All Aircraft**
- **Specific Object Instance -- Tell me the Location of Aircraft 123**
- **Attribute Value -- Tell me the Location of All Land Vehicles in Sector K**

Destination Filtering



Source Filtering



Implementation Considerations

- **RTI Maintains No Knowledge of Simulation or Participants (Basic HLA Philosophy)**
- **RTI Maintains No Knowledge of the Meaning or Format of the Attributes it Transports**
- **Therefore RTI cannot Directly Examine & Filter on Attribute Values**
- **Federate & RTI Cooperate on Value Filtering**
 - **Federate Provides Additional Information to the RTI Based On its Knowledge of the Simulation**
 - **Publication & Subscription may be Based on Such Additional Information**

HLA Architecture Implications

- **What Functions Belong in the RTI and Which Belong in the Federates?**
- **How are RTI Services Accessed (Interface Specification)?**

Proposed HLA Baseline Approach

- **Federates Define One or More “Filter Specs”**
 - **Indicate Dimensions & Attribute Values on Which a Federation Would Like to Manage Interest Specifications**
- **Federates Subscribe & Publish in Terms of these Filter Specs**
- **Federates Associate Attribute Values with Filter Specs when they are Updated**
- **RTI Manages Flow of Data Based on Subscribers/Publishers Associated with the Filter Specs**

Declaration Management Experiments

- **Support HLA definition by exercising proposed DM partitioning of functionality and I/F specification through**
 - **implementation and testing of RTI functionality in RTI v0.3e**
 - **using IEC to implement federate use of these DM services to exercise the I/F specification**
- **Assess performance implications of initial prototype implementation as a basis for evolution of RTI development**

DM Testing

- **Key factors:**
 - what is baseline cost (without filtering)?
 - what is best case cost (perfect filtering)?
 - what is host loading *caused* by filtering?
 - what is host loading *saved* by filtering?
- **RTI must be tested across all test scenarios, with increasing scale for:**
 - entity count
 - host count
 - state change rates
- **Caveats:**
 - Exact performance results not expected from RTI prototype -- trends and scaling are.
 - Filtering experiments will focus on update_attributes first, interactions second.

DM Experimentation Plan

- **Scenario Analysis Tool (SAT):**
 - Create an ‘abstract federation’ to generate workload, establish baseline cases for community to reference.
 - » scripted actions (i.e.. predictable and constant).
 - » scalable, calibrated via ModSAF experiments.
- **Create ‘baseline scenarios’ which roughly correspond to expected federation activities. Use scenarios to drive CLCGF and SAT.**
- **Create ‘stress scenarios’ which test the known pathological cases.**

Planned Scenarios

(Based on existing CLCGF scenarios)

- **Case 1 - Ground Forces (25-50)**
 - Entities: Blue M1; Red T72M
 - Blue forces begin approx 5 km from red forces, and conduct attack against red forces in position.
- **Case 2 - Ground + Fast Movers (50-100)**
 - Entities: Blue M1, F16D, A10; Red T72M, MiG27, MiG29 Su25
 - Blue forces begin approx 5 km from red forces, and conduct attack against red forces in position. Blue aircraft conduct air-to-ground attacks against red tanks, and red aircraft recon in circular orbit around the red tank position.
- **Case 3 - Ground + Fast Movers + WAV (100-250)**
 - Entities: Blue M1, F16D, A10, US UAV CAP; Red T72M MiG27, MiG29, Su25, USSR UAV CAP
 - Blue UAVs conduct early reconnaissance of red tank positions. Red UAVs conduct recons of blue tank force routes. Blue tanks begin approx 5 km from red forces, and conduct attack against red forces in position. Blue aircraft conduct air-to-ground attacks against red tanks, and red aircraft circle around the red tank position.
- **Add scale based on performance results.**

IEC/JPSD Use of RTI Filter Space Mechanisms

- **Filtering on geographic location**
 - Filter on x, y axis
 - An entity's subscription extent will be set to 2x it's radar range and reset when it approaches 1x.
 - An entity's publication extent will be set based on it's location and thresholds returned from the RTI.
 - Design & implementation will allow easy extension to filter on additional Filter Space variables.

Current Status of Experiments

- **Synthetic Workload Tool**
 - Extensions have been completed to the SAT tool for entity-level traffic generation.
 - SAT (beta) has been ported to the SUN platform.
 - SAT (beta) is being installed & integrated this week into the IEC testbed.
- **Physical Network Baseline**
 - Incorporation of NRL/SEID work: Calibrate cost of network accesses in a multicast environment.
 - Collection of network and protocol statistics in IEC has begun.
- **Scenarios**
 - Several test scenarios have been defined for the Synthetic Workload Tool. Work is ongoing.
 - CLCGF scenarios have been defined and are being tested.
- **Execution Plans**
 - Exercise Manager plans for initial CLCGF tests are being defined and tested at the testbed. (Automated mechanism for launching repeatable tests.)

Current Status of Experiments (cont...)

- **RTI v0.32e**
 - Compiled and relinked with 0.32e
 - Migration of RTI invocations to new API functions in progress
 - Implementation of Filter Space support code starts 6/17
- **Performance Instrumentation**
 - FCS/RTI instrumentation and testing ends this week
 - Network & process MOPs can be collected early next week